

Applicant responds that claims 29-33, 43, and 45 are dependent on claim 1, which contains a reference to polycyclic aromatic hydrocarbons. Therefore claims 29-33, 43, and 45 do read on polycyclic aromatic hydrocarbons in general, including pyrene. Therefore the Office Action was mistaken in withdrawing claims 29-33, 43, and 45 from consideration, and Applicant requests the reinstatement of those claims.

Applicant therefore asserts that claims 1-45 are still properly pending in the application.

Applicant appreciates the indication of allowable subject matter in claims 11, 12, 17-21, 28, and 34-42 on page 3 of the Office Action, but requests clarification, in view of the apparent rejection of claims 21 and 34-42, which are included within "claims 5, 6, 20-22, 28, and 34-42", which are rejected under 35 U.S.C. §112(2) on page 2 of the Office Action. More significantly, Applicant believes all the claims are allowable in view of the amendments and Remarks that follow.

Rejections Under 35 USC § 112(2)

Claims 5, 6, 20-22, 28, and 34-42 are rejected under 35 USC §112(2) as allegedly being indefinite for failing to distinctly claim the subject matter regarded as the invention.

- A. The Office Action requests the amendments of claims 5 and 20 to correct "Claim 1" to read as two words. Applicants have accordingly amended those claims, as shown above and in Appendix B. No narrowing is produced by these claims amendments.
- B. The words "high" and "low" are rejected in claim 6, as being "subjective and thus unclear." Applicant responds that the words "high" and "low" are not used in isolation in claim 6, as apparently believed by the Examiner. The words are used as one word in the multi-word

terms “low molecular weight polycyclic aromatic hydrocarbon” and “high molecular weight polycyclic aromatic hydrocarbon,” both of which multi-word terms are defined and/or described with particularity in the specification on page 12. Hence, the words “high” and “low” are not “subjective,” or objectionable. Accordingly, the rejection should be withdrawn.

- C. The Office Action rejects claim 22(b), on the grounds that it is not clear what the activities and/or sources of the waste or waste products are. This facet of the invention is described on specification page 15, lines 20-27, and merely relates to the combustion of carbon-containing waste materials to form the flames of Claim 1. The nature and/or source of the carbon-containing waste materials is not crucial to the invention, so long as the flame of Claim 1 is maintained. Therefore, although the conditions required to combust various sources of carbon-containing waste materials vary with the identity and relative quantities of the various carbon-containing materials, it is not possible or necessary to the invention to more specifically define those variables, because it is well within the average skill in the art to combust carbon-containing wastes so as produce a sooty flame. Therefore, Applicant asserts that the use of the terms “waste or waste products derived from waste reclamation activities is not indefinite or unclear. Applicant therefore submits that the rejection has been overcome and should be withdrawn.
- D. The Office Action rejects claim 28 on the basis that it “is unclear as to what the reactions are; the material is already a hydrocarbon. What further reactions are necessary?”

Applicants respond that the “reacting” of claim 28 primarily relates to the various chemical reactions necessary to convert the polycyclic aromatic hydrocarbons of the condensed phase of Claim 1, to provide the carbonaceous materials of Claim 28. One major difference

between the two classes of materials is that the polycyclic aromatic hydrocarbons comprise substantial numbers of hydrogen atoms bound to the carbon atoms (see specification page 10, lines 1-14), while carbonaceous materials (such as fullerenes and/or nanotubes) comprise few or no hydrogen atoms (see specification at page 18, lines 4-12, and page 19, lines 21-23). Thus, "reacting" comprises, at least in a major aspect, the removal of hydrogen from the polycyclic aromatic hydrocarbons, which are relatively hydrogen rich, to form carbonaceous materials, which are typically hydrogen poor.

Nevertheless, "reacting" is not limited to the removal of hydrogen from the polycyclic aromatic hydrocarbons, to form the carbonaceous materials. In some embodiments, reacting comprises "carbonization" of the polycyclic aromatic hydrocarbons, to form carbonaceous materials. Dimerizations, polymerizations, and/or rearrangements of the carbon skeletons of the various species of polycyclic aromatic hydrocarbons of the condensed phase are also involved in "reacting" and/or carbonization, as is described on pages 20 and 21 of the specification. The exact nature of, sequence, and mechanisms of the reactions that occur in the complex mixtures, to produce the carbonaceous materials are not known or well understood in detail, and hence cannot be more precisely specified by Applicant. Moreover, claim 28 is specific in that it requires that at least one carbonaceous material is formed. Applicant therefore submits that claim 28 is as distinct as the nature of the subject matter allows, and is therefore legally permissible, and that the rejection should therefore be withdrawn.

**Rejections Under 35 USC § 102(b)**

Claims 1-10, 13-16, 22-27, and 44 are rejected under 35 USC 102(b) as allegedly being anticipated by Baum et al. (Ber Bunsenges Phys. Chem. 96(7) 841-857, 1992, hereinafter referred to

as “Baum”). The Office Action alleges that “Baum teaches, especially on pg 848, making soot in an acetylene flame. The presence of pyrene is deemed inherent, since the same step disclosed in the specification is performed.”

Applicant responds that the rejection stated in the Office Action is legally insufficient to constitute a valid rejection for anticipation, because nowhere does the Office Action specifically identify in the cited prior art all the elements of Applicant’s claims. Applicant’s claim 1 reads as follows:

1. A method for producing a polycyclic aromatic hydrocarbon comprising:
  - a. condensing at least one carbon-containing material in a flame to form a condensed phase; and
  - b. collecting at least a portion of the condensed phase from the flame;  
wherein the condensed phase comprises at least one polycyclic aromatic hydrocarbon.

Baum teaches the presence of soot, certain fullerenes, and /or generically teaches the presence of certain polycyclic aromatic hydrocarbons in the gas phase of flames. The presence of the polycyclic aromatic hydrocarbons and/or fullerenes in the flame is deduced from mass spectral analysis of the gas phase of the flame. Nevertheless, Baum does not teach the formation, in the flame, of a condensed phase comprising at least one polycyclic hydrocarbon. Baum certainly does not teach that such a condensed phase comprises pyrene. Regardless of whether pyrene (or any other particular species of polycyclic aromatic hydrocarbon) is or is not “inherently” produced in a gas phase flame, Baum does not teach or suggest that the polycyclic aromatic hydrocarbons condense, in the flame, to form a condensed phase.

Moreover, Baum does not teach, as does claim 1, that the condensed phase comprising polycyclic aromatic hydrocarbons can be collected, so as to provide a method for producing polycyclic aromatic hydrocarbons. As taught in the specification at page 16, lines 18-22, "collection" involves removing the condensed phase from the combustion zone of the flame, to a remote location. Baum does not teach that a condensed phase comprising polycyclic aromatic hydrocarbons should be removed from the flame. Baum certainly does not teach that the collected condensed phase can be employed as a source of polycyclic aromatic hydrocarbons that may then be subsequently reacted to form valuable carbonaceous materials, such as fullerenes and/or nanotubes, as shown in claims 28-42.

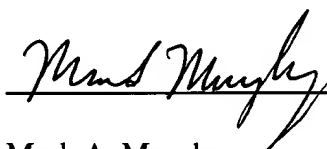
Therefore, because Baum does not teach the presence in the flame of a condensed phase comprising polycyclic aromatic hydrocarbons, and does not teach that the condensed phase should be collected, Baum does not anticipate Applicant's claimed methods of producing polycyclic aromatic hydrocarbons and/or carbonaceous materials. Therefore, the anticipation rejection of Applicant's claims 1-10, 13-16, 22-27, and 44 has been overcome and should be withdrawn.

Conclusion

In view of the amendments and Remarks hereinabove, Applicant submits that all grounds of rejection have been overcome, and the claims Application is in condition for allowance. Enclosed is a Petition for a one month extension of time, and a check for \$110.00 (No. 48970) for the extension of time. No other fees are believed due; however, the Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 14-0629. Should the Examiner have any questions regarding this application, he is invited to telephone the undersigned at her earliest convenience.

Respectfully submitted,

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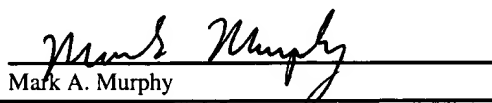



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CERTIFICATE OF MAILING

I hereby certify that this RESPONSE TO OFFICE ACTION is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231, on the date listed below.

  
Mark A. Murphy  
Date

**Appendix A**  
**Marked-Up Copy of Replacement Specification Paragraphs**

The marked up paragraph below shows the amendments to the first incomplete paragraph on Page 3.

formed in flames, and that the polycyclic aromatic hydrocarbons may be precursors of soot in flames (see for example, Dobbins *et. al.*, Combust. Sci. and Tech., Vol. 121, pg 103-121, 1996). Polycyclic aromatic hydrocarbons ("PAHs") are a large class of hydrocarbon compounds having fused five and/or six membered aromatic ring residues. A list of about 622 known polycyclic hydrocarbons has been tabulated by Sanders and Wise of the National Institute of Standards and Technology, in NIST Special Publication 922, available at [<http://ois.nist.gov/pah/> and /or <http://ois.nist.gov/pah/alpha.htm>] *inter-alia*, the NIST website.

The marked up paragraph below shows the amendments to the first complete paragraph on Page 11.

In many preferred embodiments, the polycyclic aromatic hydrocarbon comprises a plurality of fused five and six membered rings, some or all of which may be aromatic rings. A preferred subset of the PAH compounds within the scope of the invention includes about 660 known low and moderate molecular weight PAH compounds identified in National Institute of Standards and Technology Special Publication 922, available at [<http://ois.nist.gov/pah/alpha.htm>] *inter-alia*, the NIST website, which is hereby incorporated in its entirety by this reference. Most of the PAH compounds listed in Special Publication 922 are fully aromatic, in that all possible positions of the rings are part of conjugated double bond systems.

**Appendix B**  
**Marked-Up Copy of Amended Claims 5 and 20**

5. The method of Claim\_1, wherein the polycyclic aromatic hydrocarbon has sufficient hydrogen atoms to have at least one ring with at least one saturated -CH<sub>2</sub>- group.
20. The method of Claim\_1, further comprising the step of extracting the collected condensed phase with an extraction medium.